PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

A Fire-Resistant Sheet Material

We, BRONZAVIA, a French Body Corporate, of 207, Boulevard Saint Denis, Courbevoie, Seine, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to fire-resistant sheet materials.

It is known that on board aircraft, certain walls, such as the cowlings of the engines or turbo-motors and certain fuselage partitions, must be capable of serving as screens against the propagation of fire.

The purpose of these screens is to prevent the working structure of the aircraft from being exposed to flame, or subjected to heating which would comprise its behaviour.

In fact this protection is obviously limited, and it is sufficient that it should be effective for the time necessary for the extinguishing of the fire.

The requirements made of these screens are in general quite severe, and in this respect various standards exist which fix the conditions under which the material of the screen, exposed to flame at a quite high temperature and subjected to a stress which is also predetermined, must neither melt nor yield.

Thus one has been induced to use, in place of sheets of light alloy, either sheets of stainless steel, which are very heavy, or sheets of titanium, which are very expensive.

The present invention has for its object to remedy the disadvantages which have been indicated above, and we have observed that, if the wall is produced in the form of two sheets, one very thin of stainless steel, the other of light alloy, and if the composite sheet is exposed to the flame on its stainless steel side, the assembly of these two sheets behaves much better than a sheet of stainless steel alone.

We have already proposed the construction of heat resistant linings, composed of at least one sheet of aluminium and at least one sheet of fluted sheet metal between which glass wool is disposed.

However, it should be stated that these linings have the object of constituting an assembly of low conductivity by reason of the presence of the glass wool.

According to the invention there is provided a fire resistant sheet material comprising a sheet of light metal and a sheet of steel having separate spaced embossed portions, the summits of said embossed portions facing towards the light metal sheet and the bases of said embossed portions facing towards the expected location of fire, said sheets being rivetted one to the other at intervals greater than the spacing of the said embossed portions so as to provide between the rivets embossed areas of material at which the sheets are relatively movable apart.

The invention will now be described, by way of example, with reference to the accompanying drawing, wherein:

Figure 1 is a plan view of a fire-resistant sheet material constructed in accordance with the invention, with partial removal of the light metal sheet, and Figure 2 is a longitudinal section along the line II—II of Figure 1.

Referring now to the drawing an aluminium sheet 1, the thickness of which is 10/10 of a mm., is attached to a sheet of stainless steel 2, the thickness of which is 1/10 mm.

The sheet of stainless steel 2 is stiffened by series or rows of separate spaced embossed portions in the form of small elongated beads 3.

Each of the beads 3, as seen in outline in plan view, takes the shape of two identical semi-circles joined by two parallel lines, the overall longitudinal length of each bead being about four times the diameter of the semi-circles (i.e. the width of the bead).

The beads 3 are formed in the sheet 2 in parallel rows with the beads in each row arranged longitudinally of the row and spaced about the length of a bead apart and the rows

themselves being spaced transversely about the length of a bead apart, with the beads of each row being juxtaposed the spaces between the beads of adjacent rows. Two patterns of rows are formed in the sheet 2, one pattern being perpendicular to the other, the beads of one pattern lying in the spaces between the beads of the other pattern.

These beads strengthen the sheet 2 against bending and maintain a spacing "*h*" between the two sheets 1 and 2.

However, the contact between the two sheets is discontinuous, for it occurs only at the line contact of the summits of the beads 3, since the sheet 2 is arranged with the summits of the beads facing the sheet 1 and the bases of the beads facing away from the sheet 1.

These characteristics are important, as it is supposed that, when the sheet 2 is exposed to flame, the beads 3 diffuse and radiate the heat of the flame; furthermore, transference of heat by conduction between the two sheets is reduced to the minimum and the air gaps between the two sheets constitutes a thermal insulation.

If the sheet material represented in Figures 1 and 2 is arranged horizontally with the aluminium sheet uppermost and with a weight of 1.5 kg. resting on said sheet, and the stainless steel sheet is exposed to the flame F of a Bunsen burner, it is observed that the sheet material does not break down during a quarter of an hour, and that in this time an equilibrium temperature is attained, so that thereafter fusion and break down will not be expected.

Under the same conditions, a sheet of 10/10ths mm. of light alloy would be perforated in about 30 seconds.

If stainless steel alone had been used, it would have been necessary to use a thickness of at least 5/10ths mm. to carry a weight of 1.5kg. in the cold state, and more in a hot state; this construction would not only have led to a greater weight and a greater cost, but a wall of this thickness would be deformed under the action of the expansion and would have caused dangerous stresses in the structure of the aircraft.

If for example a sheet of 1/10 mm. of stainless steel and a sheet of light alloy of 10/10 mm. are used, it is observed that the sheet material possesses excellent behaviour in fire, although, of a total thickness of 11/10 mm., 10/10 mm. are constituted by a metal of relatively low strength.

This observation permits a reduction in cost and the weight of partition walls, since the corresponding 10/10 mm. are constituted by a relatively light and inexpensive material.

The two sheets are united with one another by rivets 4, relatively widely spaced and arranged, for example, in quincunx. In fact it will be observed that when the sheet of stainless steel 2 of the sheet material is exposed to the flame, the instantaneous heating of the free face of the sheet 2 causes it to bend away from the sheet 1, as represented in broken lines in the drawing, by reason of the different coefficients of expansion of the two materials. The stainless steel is heated to very high temperature at white heat, whereas the light alloy is at a much lower temperature (about 280°C.). It is clear under these conditions that relatively wide spacing of the rivets 4 is advantageous.

It is further observed that if the flame exerts its action in the region of these rivets no local fusion occurs, since the rivets easily dissipate the heat.

Thus it is seen that the sheet material is reliable as a fire-resistant material and that it is especially useful to protect aircraft parts against fire.

This sheet material can be used either to constitute the external facings of aircraft, or for the internal fire-proof partitions interposed between the different parts of the fuselage.

The sheet material of the invention provides, at low cost, a protection for many structures for a sufficient time for extinguishing to be effected, when this is possible, and which in any case limits the spread of the fire.

The stainless steel sheet can alternatively be mounted in manufacture with a certain curvature between the rivets, in order to accentuate the separation which occurs between the sheets under the action of a flame.

WHAT WE CLAIM IS:—

1. A fire-resistant sheet material comprising a sheet of light metal and a sheet of steel having separate spaced embossed portions, the summits of said embossed portions facing towards the light metal sheet and the bases of said embossed portions facing towards the expected location of fire, said sheets being rivetted one to the other at intervals greater than the spacing of the said embossed portions so as to provide between the rivets embossed areas of material at which the sheets are relatively movable apart.

2. A material as claimed in claim 1, wherein the steel sheet is made of stainless steel.

3. A material as claimed in claim 1 or 2, wherein the rivets are arranged in quincunx in said material.

4. A material as claimed in claim 1, 2, or 3, wherein said embossed portions are each formed in the shape of two identical semicircles joined by two parallel lines.

5. A material as claimed in claim 4, wherein said embossed portions are formed in the steel sheet in two patterns which are mutually perpendicular, said patterns being formed by parallel rows of said portions, the portions of one pattern being arranged in spaces between the portions of the other pattern.

6. A material as claimed in any one of claims 1 to 5, wherein said steel sheet is mounted in manufacture with a certain curva-

ture between the rivets so as not to contact the light metal sheet between the rivets.

7. A material as claimed in any one of claims 1 to 5, wherein said steel sheet is mounted flat in manufacture so that all the summits of the sheet contact the light metal sheet.

8. A fire-resistant sheet material substantially as described with reference to the accompanying drawing.

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919839 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG.1

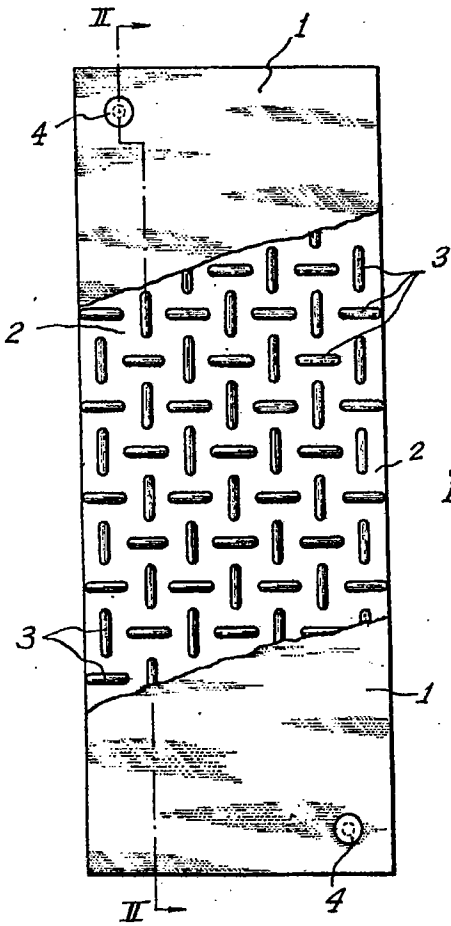

FIG.2